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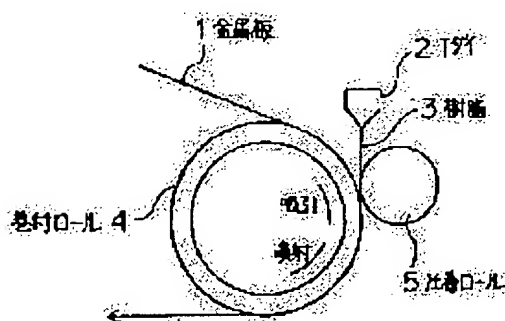
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## (54) MANUFACTURE OF LAMINATED METAL PLATE

(57)Abstract:

PURPOSE: To improve adhesive properties, processibility, corrosion resistance and external appearance and to manufacture a metal plate with high yield by covering with a thermoplastic resin film, injecting gas from a hole opened at a surface of a winding roll so as not to bring the film fed from the plate into contact with the roll, and peeling the film from the roll.

CONSTITUTION: A width of a thermoplastic resin film 3 fed down to the gap between a press-bonding roll 5 and a metal plate 1 is set larger than that of the plate 1. The entire width of the plate 1 is covered at a lateral center of the film 3. Simultaneously, a vicinity of a pressure contact part of the roll 5 is sucked from a hole opened at a surface of a winding roll 4. Further, in order to prevent the film 3 fed largely from the width of the plate 1 from being brought into contact with the roll 4, gas is injected from the hole opened at the surface of the roll 4 of a part overcoated with resin



to peel the film 3 from the roll 4.

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## MEANS

[Means for Solving the Problem] this invention to namely, the preheated metal plate which was twisted around the roll with a volume which prepared puncturing in the front face In the method of carrying out the pressure welding of the sticking-by-pressure roll, flowing down the thermoplastics film fused from the T die through the extruder in the gap of a sticking-by-pressure roll and a metal plate, covering thermoplastics to a metal plate, and manufacturing a lamination metal plate While making larger than the width of face of a metal plate width of face of the thermoplastics film which flows down in the gap of a sticking-by-pressure roll and a metal plate, having it in the crosswise center section of the thermoplastics film and covering full [ of a metal plate ] In order to prevent drawing in near the pressure-welding section of a sticking-by-pressure roll from the hole punctured on the front face of a roll with a volume, and the thermoplastics film which flowed down still more greatly than the width of face of a metal plate twisting, and sticking to a roll, the manufacture method of the lamination metal plate characterized by injecting a gas from the hole in which the portion by which the overcoat was carried out twisted and the resin carried out opening on the surface of the roll, twisting this resin film, and making it exfoliate from a roll -- it comes out

[0021] Hereafter, this invention is explained in detail, referring to a drawing.

[0022] In this invention, a thick steel plate and a thick galvanized steel sheet, the zinc-alloy plating steel plate, a tin plated steel plate, a tin-alloy plating steel plate, an aluminum plating steel plate, an aluminium alloy plating steel plate, or a stainless steel board of board thickness etc. is first used as a metal substrate from the use used for building materials, such as a roof, a wall, and a partition, the charge of automobile material, the material of a home electrical-and-electric-equipment product, furniture, a can, etc.

[0023] Furthermore, what has an about 0.1-5micro chemical-conversion layer on this is contained.

[0024] In order that a chemical conversion may raise the corrosion resistance of a metal substrate, oxidation resistance, and adhesion, it is performed as surface treatment of a metal plate, and is performed by phosphoric-acid zinc processing, phosphoric-acid iron processing,

or the electrolytic chromate treatment.

[0025] Furthermore, after not performing a chemical conversion or performing a chemical conversion, what has an adhesives layer on this is contained.

[0026] An adhesives layer is a layer which applied about several [ at least ]micro adhesives, in order to improve the adhesion of a metal substrate and thermoplastics.

[0027] As these adhesives, the adhesive thermoplastics which has functional groups, such as a denaturation polyethylene resin, a denaturation epoxy resin, and denaturation vinyl resin, is suitable.

[0028] Adhesion is good for the both sides of a metal and the thermoplastics used for covering, for example, in the case of a polyolefine covering steel plate, a denaturation polyolefine like an ethylene-vinyl acetate copolymerization resin or an ethylene-acrylic-acid copolymerization resin is suitable for these.

[0029] The thermoplastics used for covering by this invention For example, a polyethylene-terephthalate resin, Polyolefin resin, acrylic resin, polyester resin, polyamide resin, Vinyl chloride resin, a fluororesin, polycarbonate resin, a polystyrene system resin, ABS plastics, a chlorinated-polyether resin, a urethane resin, etc. are typical. to polyolefin resin There are a polymer or copolymers, such as ethylene, a propylene, 1-butene, and 1-pentene. as acrylic resin There are a polymer or copolymers, such as an acrylic acid, a methacrylic acid, an acrylic ester, methacrylic-acid ester, and an acrylamide. to polyester resin There are a polyethylene terephthalate, oil free polyester, etc. to polyamide resin There are the so-called Nylon 66, nylon 6, Nylon 610, Nylon 11, etc. to vinyl chloride resin There is a copolymer with vinyl acetate, others, for example, ethylene, etc., and there are a polytetrafluoroethylene, a 3 \*\*\*\*-ized ethylene chloride resin, a 6 \*\*\*\*-ized ethylene propylene resin, \*\*\*\*-ized vinyl resin, \*\*\*\*-ized vinylidene resin, etc. in a fluororesin. [ homopolymer ]

[0030] Moreover, you may mix and use two or more resins. Moreover, the additive usually used at the time of film creation, for example, a degradation inhibitor, the modifier, the pigment, etc. may be included.

[0031] Moreover, in case it covers with a melting state, you may add cross linking agents, such as amino resin and an epoxy resin, in the range which does not lose a fluidity.

[0032] These thermoplastics is suitably chosen according to needs, such as weatherability, cold district aptitude, thermal resistance, scratch-proof nature, resistance to contamination, chemicals-proof nature, and deep-drawing processability, according to the use of a surface treatment metal plate. For example, a polyolefine is excellent in cold resistance, a polyamide is excellent in abrasion resistance, acrylic resin is excellent in resistance to contamination or chemicals-proof nature, and it is excellent [ a fluororesin ] in weatherability etc.

[0033] The polyethylene-terephthalate resin is especially useful for an acid-proof use.

[0034] Multilayer covering of that monolayer covering is also of the same kind or a different-species resin is sufficient as a resin. In multilayer covering (for example, a multilayer T die), it can carry out, and a glue line can also be prepared between layers.

[0035] At an interlayer thermoplastics in the upper layer for an adhesive resin to a lower layer for example, by the three-layer T die [ the steel plate which is applying and preheating adhesives ] [ the thermoplastics in a melting state ] It can extrude in the shape of a film, and the surface treated steel sheet which carried out multilayer covering directly and continuously can be obtained. Or thermoplastics can be obtained in the 1st lower layer and the surface treated steel sheet which extruded thermoplastics in the shape of a film by the four-layer T die in the 4th best layer at the 3rd interlayer, and carried out multilayer covering of the adhesive resin directly and continuously can be obtained for the adhesive resin which is in the steel plate which is preheating at a melting state to the 2nd interlayer.

[0036] A drawing explains a manufacturing process below.

[0037] A metal substrate needs to precede covering a melting resin and it is necessary to preheat it.

[0038] For example, in the case of a polyethylene terephthalate, the preheating of -120 degrees C or more (therefore, about 135-255 degrees C) of melting points (255 degrees C) is desirable.

[0039] By carrying out a preheating, the fluidity of a resin increases and adhesion improves.

[0040] When not performing a preheating, or when preheat temperature is low and a cooling roller is especially used, the adhesion of a resin is not enough and a result which lacks in corrosion resistance is brought.

[0041] Although the temperature of a preheating is so desirable that it is high since the fluidity of a resin increases, since a resin and adhesives will decompose if too high, it is not desirable. Moreover, it is not desirable from a viewpoint of energy saving.

[0042] Therefore, it is preferably carried out below the temperature of a melting resin by temperature lower 50 degrees C or more than the temperature of a melting resin, and the preheat temperature of about 50-230 degrees C of usual.

[0043] Drawing 1 carries out the pressure welding of the sticking-by-pressure roll 5 to the front face of the metal substrate 1 which twisted and was twisted around the roll 4 and which it preheated, flows down the thermoplastics film 3 fused from T die 2 through the extruder to the interface of the metal substrate front face and sticking-by-pressure roll 5, and shows the lamination metal plate manufacture method of \*\*\*\*\* (ing) a thermoplastics film to the metal substrate 1.

[0044] Regulation of film \*\* or a surface state is easy for this method. For example, it is also easy regulation of surface gloss and to give an embossing pattern to a front face.

[0045] As for the metal substrate 1 with which the elevated-temperature melting resin 3 was covered, cooling \*\*\*\*\* is performed. Even if cooling may perform a water spray for example, after air cooling and it makes it pass through a water-cooled tub, you may let a cooling roller pass.

[0046] Thus, in this invention, although the surface treatment metal plate of this invention is obtained, since the hole which carries out opening was prepared in the front face of the shaft-orientations portion of the roll with a volume which a thermoplastics film covers, the roll surface coating area of a resin decreases and, only in the part, the adhesion force on the front face of a roll of a resin decreases [ effective-area integration ].

[0047] Moreover, the resin film which covered the roll front face with a volume surfaces with a gas, without disturbing the thermoplastics film which flows down from a T die, since the gas feeder style which supplies a gas to the hole of opening which a thermoplastics film covers behind from a pressure-welding position was prepared.

[0048] Furthermore, since the gas which had between the surfacing resin film and roll front faces injected flows, while a resin film is cooled, a roll front face is also cooled and the adhesion force on the front face of a roll of a resin decreases further (Japanese Patent Application No. No. 250380 [ four to ]).

[0049] Drawing 3 is the direction view [ in / drawing 3 / respectively / in the cross section of equipment, drawing 4 , and 5 and 6 ] of X-X, the direction view of Y-Y, and Z-Z direction view.

[0050] As shown in drawing 3 and 4, this invention is the front face of the roll 4 with a volume (roll volume attachment) which the preheating metal plate 1 coils and is passed. As opposed to the thermoplastics which makes width of face WP of thermoplastics 3 larger than the board width WM of a metal plate 1, and covers opening of a roll front face with a volume The hole which carries out opening to the shaft orientations of the portion to cover is prepared, and a gas is injected [ position / pressure-welding / of a nip roll (sticking-by-pressure roll) 5 ] from a hole in the back section.

[0051] Drawing 3 shows having formed the wind box which slides on this roll inner skin as a method of supplying a gas to the hole.

[0052] Moreover, although the gas is injected from the pressure-welding position of a nip roll

5 in drawing 3 in the field in which a metal plate 1 separates from the roll 4 with a volume behind, a wind box is extended, also about the roll front face with a volume which thermoplastics has not covered, if a gas is made to inject, a roll skin temperature can be made to be able to fall more and cooling of the thermoplastics which covered the roll front face can be promoted.

[0053] Furthermore, if a wind box is made into block construction by the circumferencial direction, strength can be attached to gaseous injection or the injection pattern of a finer gas can be realized.

[0054] However, the position which injects a gas needs to select a proper position by the thermoplastics flowing down, warning against the thermoplastics of the melting state which flows down from a T die not shaking, or making it a position which will be in the state where it cannot stabilize and flow down.

[0055] Drawing 5 shows having formed the hole 10 penetrated in the roll thickness direction with a volume into the portion which lines thermoplastics and detachability good rubber 52, for example, poly 4 \*\*\*\*-ized ethylene rubber, and thermoplastics covers in the periphery of the metal sleeve 51.

[0056] Furthermore, supply of the gas to this hole forms the wind box 9 which slides on the inner skin of a roll, and a gas is supplied to this wind box by the gas supply pipe 61.

[0057] In addition, this wind box is connected with a part for a shank by the socket 56, and since it is pressed against the inner skin of a roll with the spring 58 inserted into the socket, there is little leakage at bulb of the gas to inject.

[0058] Furthermore, the axial structure of this equipment is the double-pipe structure of an outer tube 55 and a shaft 54, and moving part 53 is between this outer tube and a shaft. The slot 63 can be open to shaft orientations at the outer tube, and a socket 56 can move now to shaft orientations.

[0059] When the move mechanism is shown, this moving part and shaft are in the relation between a nut and a bolt, and if a shaft rotates, moving part will move in connection with it.

[0060] That is, if a shaft is rotated, a wind box is movable to shaft orientations with a socket. Therefore, it can respond now to change of the board width of a metal plate which carries out plate leaping.

[0061] Moreover, the injection width of face of the wind box in the direction of roll axis with a volume can inject the gas to inject to thermoplastics effectively, if it is made the same as the resin width of face of the thermoplastics which covers a roll front face.

[0062] In addition, a shaft is fixed and this equipment has structure which only a sleeve 51 rotates through bearing 59.

[0063] Drawing 6 shows the position of the hole which carries out opening. As for the hole which carries out opening, it is good to prepare in the field to the resin width of face  $WP_{max}$  of the thermoplastics which covers the roll front face in the maximum board width  $WM_{max}$  from the minimum board width  $WM_{min}$  of the metal plate by which plate leaping is carried out.

[0064] In addition, in this invention, in case it manufactures at high speed (about line speed 40 m/min), it has been wound around the sticking-by-pressure roll side by the resin which carried out the overcoat, it coils around a sticking-by-pressure roll, and operation of it becomes impossible.

[0065] Then, it draws in near the pressure-welding point, and the resin which carried out the overcoat is stuck to the roll side with a volume at once, and it prevents that an overcoat resin adheres to a roll with a volume by injection of the lower stream of a river.

[0066] Since a resin tends to adhere to a roll by sticking by pressure, improvement of this invention is effective, especially what had a polar group as a resin, for example, a polyethylene terephthalate, (PET).

[0067] That is, it continues for about 10-30mm near the pressure-welding point (for example,

a pressure-welding point) on a lower stream of a river, a resin film is attracted to a roll side with a volume, and it prevents with [ by the side of a sticking-by-pressure roll ] a volume. [0068] Subsequently, based on a conventional method, a gas is injected from opening over about 200mm down-stream, and it prevents that an overcoat resin adheres to a roll with a volume ( drawing 7 ).

[0069]

[Example 1] Next, an example is explained.

[0070] When the metal plate 1 which the outside surface of the metal sleeve 51 preheated in equipment as shown in drawing 8 as a roll which has twisted the metal plate with the roll 4 with a volume which covered poly 4 \*\*\*\*-ized ethylene rubber 52 coils, the roll 4 with a volume which prepared the hole penetrated from the interior of a roll to the exterior in the shaft orientations of a roll installed near [ where the resin protruded from the board contacts ] the roll surface portion.

[0071] Furthermore, when the pressure welding of the roll 4 with a volume and the nip roll 5 was carried out, the wind box 9 was installed so that air might spout only from the field A of the point ending [ metal plate coiling-round ] just behind a pressure-welding portion.

[0072] Thus, after preheating a metal plate 1, extrude the PET system resin 3 to the interface of a metal plate 1 and a nip roll 5, it was made to flow down from T die 2, and the metal plate 1 was made to cover. At this time, the PET system resin 3 was widely covered every 50mm on both sides from the metal plate 1.

[0073] And without coiling around the roll 4 with a volume, the resin which protruded the PET system resin 3 into it from the metal plate 1 when air was made to blow off from the breakthrough of the roll 4 with a volume to a metal plate 1 immediately after a covering start exfoliated, and checked that line speed was stabilized to 20 m/min and it could operate.

[0074] However, when line speed increased, it stops could coil and carry out the pressure welding to the pressure-welding roll (nip roll), and operation became impossible.

[0075] Then, it continued for 30mm from the pressure-welding position, and it drew in and operated by blowing off air further from the lower stream of a river to the point ending [ metal plate coiling-round ].

[0076] The resin protruded from the metal plate as a result checked that it could exfoliate, stabilize and operate, without having not carried out coiling round to a pressure-welding roll, either, and coiling around a roll with a volume.

[0077] Moreover, it continued for 10mm before and after the pressure-welding point, and even if drawn in, the good result was obtained similarly.

[0078] As an example of comparison, when it operated without using the roll which blows off this air in the above-mentioned example, the resin protruded from the metal plate coiled around the roll which has twisted the metal plate immediately, and became operation impotentia on it.

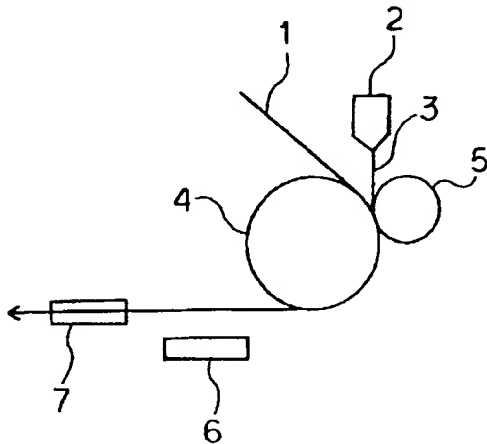
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## DESCRIPTION OF DRAWINGS

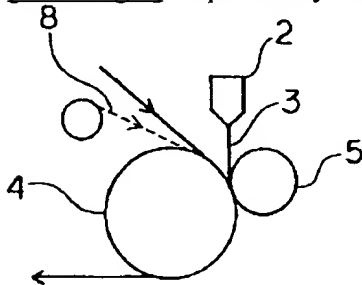
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[Brief Description of the Drawings]

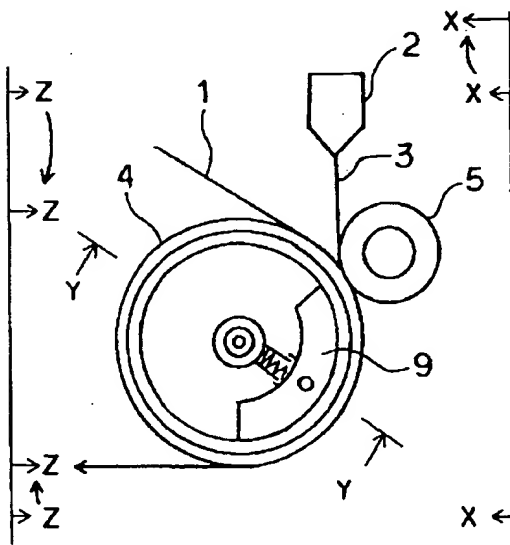
[Drawing 1] It is explanatory drawing of the method of covering by flowing down a melting resin to the interface of a metal substrate and a roll.



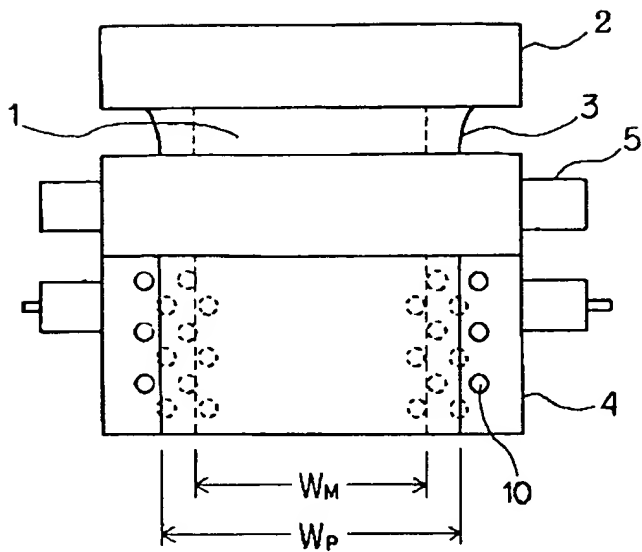
[Drawing 2] Explanatory drawing of the T die extrusion method using \*\*\*\*\* material.



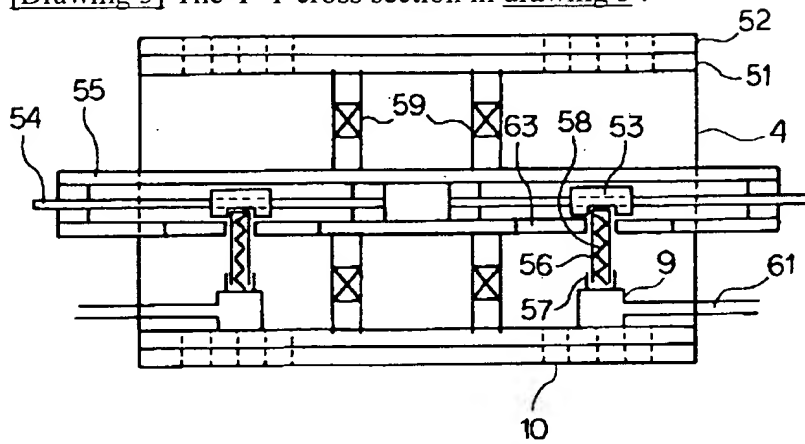
[Drawing 3] Explanatory drawing of this invention method.



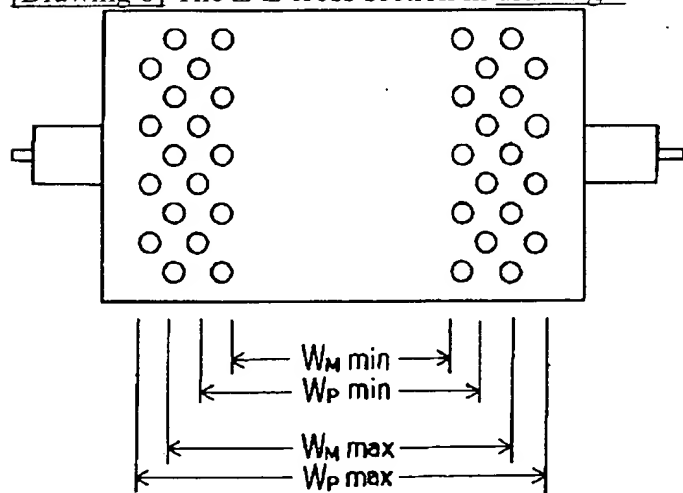
[Drawing 4] The X-X cross section in drawing 3.



[Drawing 5] The Y-Y cross section in drawing 3 .

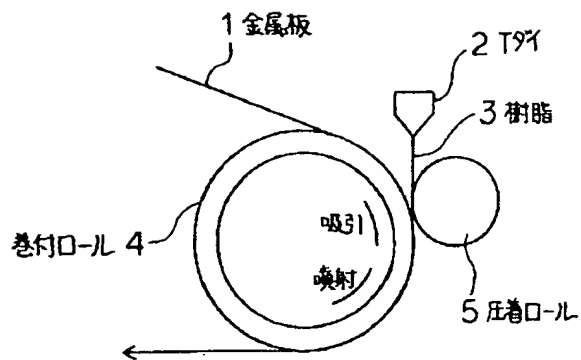


[Drawing 6] The Z-Z cross section in drawing 3 .

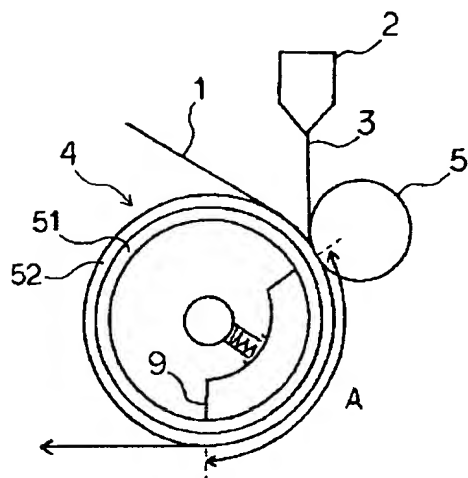


[Drawing 7] Explanatory drawing showing suction of this invention and injection.





[Drawing 8] Explanatory drawing of an example 1.



[Description of Notations]

- 1 Metal Plate
- 2 T Die
- 3 Thermoplastics
- 4 Twist and it is Roll.
- 5 Sticking-by-Pressure Roll
- 6 Cooling System
- 7 Water Spray Cooling System
- 8 \*\*\*\*\* Material
- 9 Wind Box
- 10 Breakthrough
- 51 Metal Sleeve
- 52 Rubber Lining
- 53 Moving Part
- 54 Shaft
- 55 Outer Tube (Sleeve)

56 Socket

57 Plug

58 Spring

59 Bearing

61 Gas Supply Pipe

63 Slot